Life History and Description of *Dasineura gleditchiae* (Diptera: Cecidomyiidae) in California

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The desirable qualities of thornless honey locust trees, *Gleditsia triacanthos* L. var. *inermis* Zabel, has led to their frequent use in California landscapes. *Dasineura gleditchiae* (Osten Sacken), a gall midge, has emerged as a major pest in western United States. Feeding by the larvae of this host specific cecidomyiid causes galling of young, unexpanded leaflets. As the pest matures, the galls turn brown and abscise leaving naked branches and reducing the aesthetic value of these trees.

Only short term control has been achieved using insecticides to control this pest. A biologically based IPM program may produce long term control. Our objectives included documenting the biology of *D. gleditchiae* in northern California, describing the various life stages, and inventorying the natural enemy complex associated with *D. gleditchiae* in six counties of California.

Experimental Design

Overwintering. To verify that soil is an overwintering site of *D. gleditchiae*, soil cores were collected from various distances and at various depths from the base of honeylocust trees. Cocoons, extracted from the soil cores by means of a brine flotation method, were placed in a control chamber to allow emergence of adult arthropods for identification.

Spring Emergence. Emergence of overwintering gall midges was monitored using emergence traps made of white, three-gallon plastic buckets with clear, centrifuge tubes hot-glued to the top. Emergence traps were placed within the drip line of honey locust trees (Fig. 3). Emerging adults were collected in the tubes.

Monitoring. Monitoring for adult presence was conducted by three methods: 1) emergence traps; 2) yellow sticky traps; and 3) inspection with a 10X loupe.

Biology/Description. The general biology of the pest and the descriptions were documented from observations of populations in the field and on container plants in a greenhouse.

Natural Enemy Inventory. We inventoried the natural enemy complex associated with *D. gleditchiae* by collecting terminals from honey locust trees in six California counties. The terminals were placed in emergence buckets and inspected periodically for emergence and identification of natural enemies.

Adult female *D. gleditchiae* is distinguished by antennal flagellomere. (Fig. 1)

Results

Overerwintering. *D. gleditchiae* emerged from the extracted cocoons confirming that soil is an overwintering site of this gall midge. The greatest number of gall midges overwintered in the top 2.5 cm of soil and within 2.0 m of honey locust tree trunks.

Spring Emergence. First appearance of the gall midge was mid-February in Davis. Males were captured prior to females.

Monitoring. Each method of monitoring detected adult *D. gleditchiae* and allowed correct identification of the pest.

Biology. The preferred oviposition site was along the rachis or marginal folds of unexpanded leaflets. Eggs were laid singly or in clusters. At a mean (± SE) temperature of 29±1.33ºC egg eclosion began as early as 44 h after oviposition.

First instars traveled by an undulating motion to a feeding site; the adaxial side of unexpanded leaflets. As gregarious feeders, the larvae continued to feed and develop in the galls. Pupation of the summer generations occurred within the galls and lasted approximately 4-6 days. Just before adult eclosion from pupae in galls, pupae extended one-half their anterior length between the leaflet folds that created the galls. Adults emerged from “T”-shaped slits formed on the dorsal side of the pupal exuviae. Adults were not observed feeding. Generation time ranged from 21-30 days with

This picture (above) demonstrates the use of *Gleditsia triacanthos* var. *inermis* 'Sunburst' planted on the margin of a city park. (Fig. 2)

several overlapping generations per year.

Description. The unsculpted eggs are elongate-ovoid and opaque-white which progressed to opaque-red.

First instars are cylindrical, opaque to white, and had a smooth integument with annular rings. Second and third instars were elongate and dorso-ventrally flattened with a pebbled integument. Color varied from white to orange and heads were small and retractable with two-part antennae. The third instar bilobed spatula or "breast bone" was observed on the prothorasic venter. The instar lengths ranged from 0.57 mm in the first instar to 2.44 mm in the third instar.

Pupae, approximately 2.43 mm long, were obtect with horn-like spines located at the base of the antennae. Color was white at early development but progressed to light orange or red at eclosion. Pupae were sexually dimorphic; females had a red abdomen whereas the males had a gray abdomen.

Adults (Fig. 1), approximately 2.0-3.0 mm long, had long, moniliform antennae with 12 flagellar segments, compound eyes of the holoptic type and no ocelli. The thorax was gray with two prominent, black, longitudinal stripes. Tarsomere one, of a total of five, was considerably shorter than tarsomere two and the tarsal claws had large, basal teeth. The mouth parts are reduced.

Natural Enemy Inventory. The natural enemy complex collected in California included Araneida, Coleoptera, Hymenoptera, and Hemiptera. Hymenoptera constituted 100% of the parasitoids which emerged from galls. Of those, the greatest number of parasitoids were Pteromalididae.

Control Implications

The frequency and, therefore, the amount of pesticide delivered can be reduced by timing applications when the gall midge is present rather than using calendar sprays. Pest presence can be established by monitoring.

Monitoring of adult presence prior to oviposition would allow control prior to damage. Monitoring for adults can be achieved with the use of sticky traps. The traps are readily available and easy to use. Adults can be identified on the traps using a 10X loupe or a dissecting microscope.

Not often targeted with current control measures are the egg stage and the overwintering stage. The use of narrow-range oils may prove an effective tool directed at the eggs. The overwintering stage is stationary for a long period of time allowing a large window of time for control action. Other species of *Dasineura* which overwinter in the soil have successfully been controlled targeting the overwintering stage.

The inventory of parasitoids and predators associated with *D. gleditchiae* can now be compared to the existing complex in the pest's native range. Such information may suggest classical biological control agents to suppress populations of the gall midge in California.

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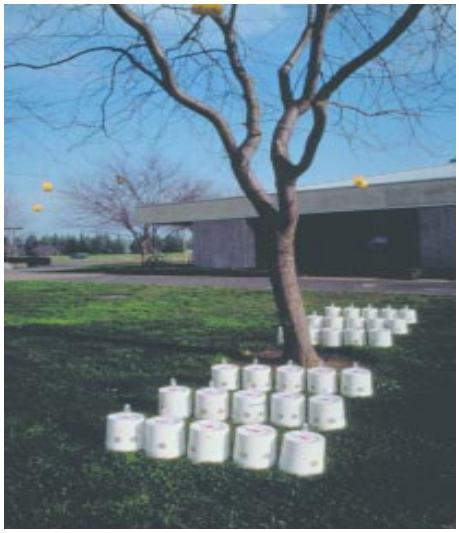

Placement of traps to monitor spring emergence of adult gall midges. (Fig. 3)